A REVISION OF THE NOMENCLATURE OF THE FAMILY NEPHTHEIDAE (OCTOCORALLIA : ALCYONACEA) -I. THE GENERA CAPNELLA, SCLERONEPHTHYA AND CHONDRONEPHTHYA (n. g.)-

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A REVISION OF THE NOMENCLATURE OF THE FAMILY NEPHTHEIDAE (OCTOCORALLIA: ALCYONACEA)

I. THE GENERA *CAPNELLA, SCLERONEPHTHYA* AND *CHONDRONEPHTHYA* (n. g.)[1]

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With 5 Text-figures

Of all the families of Alcyonacea, the Nephtheidae (Nephthyidae auct.) is probably the most difficult one to classify. This is mainly due to the enormous number of species lacking any detailed descriptions and figures under them and the confusion in their nomenclatural interpretation.

Since the extensive works on the revision of the Nephtheidae by the eminent zoophytologist Willy KÜKENTHAL (1896~1907), the revision of some genera among the family has been undertaken by some authors, mainly such as SHANN (1912), MOLANDER (1915), ROXAS (1933), MADSEN (1944) and TIXIER-DURIVAULT et PREVORSEK (1959). These authors, beyond doubt, have contributed much to our knowledge of the systematics of the family Nephtheidae. However, there are too many species still improperly ranked in any known genera most of which are vaguely or incorrectly defined based on the incorrect acceptance of genotypes or the misleading interpretation of generic characters.

In a series of short papers, some representative genera (and species) among the Nephtheidae which are available to me for study will now be reviewed, criticizing the accepted nomenclature. This paper is the first part, dealing with three genera peculiar to Indo-West-Pacific tropical seas, resulting from re-examinations of the type specimens in the British Museum (Nat. Hist.) which were obtained by the "Challenger" Expedition.

I wish to extend my sincere thanks to the Trustees and Dr. William J. REES of the British Museum (Nat. Hist.) for the gift of some fragments from the type specimens of nephtheids mentioned in the text in the "Challenger" Collections, necessary for my revisionary work.

1) Contributions from the Seto Marine Biological Laboratory, No. 344.

Genus *Capnella* GRAY

(Fig. 1)

1869 (Feb.) *Capnella* GRAY (Type: *Alcyonium imbricatum* QUOY and GAIMARD, 1833) Ann. Mag. Nat. Hist. (4), III, p. 129.

1869 (Mar.) *Eunephthya* VERRILL (Type: *Nephthya thyrsoidea* VERRILL, 1865) Amer. J. Sci. Arts, XLVII, p. 284.

1889 *Paranephthya* WRIGHT and STUDER (Type: *Paranephthya capitulifera* WRIGHT and STUDER, 1889) Rep. Sci. Res. Challenger, Zool., 31, p. 227.

Redescription of the Type Specimen of *Paranephthya capitulifera* WRIGHT and STUDER:—This specimen was obtained by the "Challenger" Expedition at Samboanga, Philippines and first described by WRIGHT and STUDER (1889, p. 227, pl. 36A, figs. 1a, 1b; pl. 42, fig. 8). However, their descriptions are not detailed in spiculation. The following account on the details of spiculation from the type specimen, supplementing to all earlier descriptions made by the other authors on different materials, may support the synonymy given below and the separation from other allied genera and species.

The polyps are closely arranged on the lobes, and they are all bent inward, club-shaped and not retractile. Their length reaches 2 mm and their greatest width 1 mm. The surface of the polyps is uniformly granular as on the branches or stem, not differentiating them in spicule arrangement.

The polyp armature consists of a coat closely packed with foliaceous capstans, graduating into foliaceous clubs at the distal end of the polyp. The cortex of the branches is likewise closely packed with similar foliaceous capstans.

These cortical spicules remind those of some gorgonaceans such as *Mopsella*, *Wrightella* and *Echinogorgia* in shape. The toothed foliaceous expansion at the head is always exposed outsides and the basal portion consisting of 2–5 bluntly pointed rootlike processes is placed under the surface. Toward the distal end of the polyp the basal portion becomes one-sided, one of the rootlike processes developing laterally as a long thick, thorny process and thus forming an apparent "foliaceous club."

In the canal-walls of branches which are much spiculated, the spicules are mostly barrel-shaped, much tuberculated spheres in large form and double-spheres or 4-rayed in smaller form.

Measurements of Spicules (in mm):—

Distal end of polyps: Foliated clubs—0.09×0.056; 0.11×0.056; 0.13×0.075; 0.14×0.07

Lower part of polyps: Foliated capstans—0.075×0.056; 0.075×0.066; 0.096×0.066

Cortex of branches: Foliated capstans—0.084×0.056; 0.096×0.066; 0.096×0.084

Coenenchyme of branches: Tuberculate double-spheres or spheres—0.12×0.12; 0.09×0.05

Coenenchyme of stem: Tuberculate spheres—0.16×0.1; 0.23×0.23; 0.26×0.19

Remarks:—As discussed by KÜKENTHAL (1903, p. 127), THOMSON and DEAN (1931, p. 71) and ROXAS (1933, p. 388), WRIGHT and STUDER's *Paranephthya capitulifera* is unseparable from GRAY's *Capnella imbricata*, though I had no opportunity to re-examine QUOY and GAIMARD's type specimen of the latter.

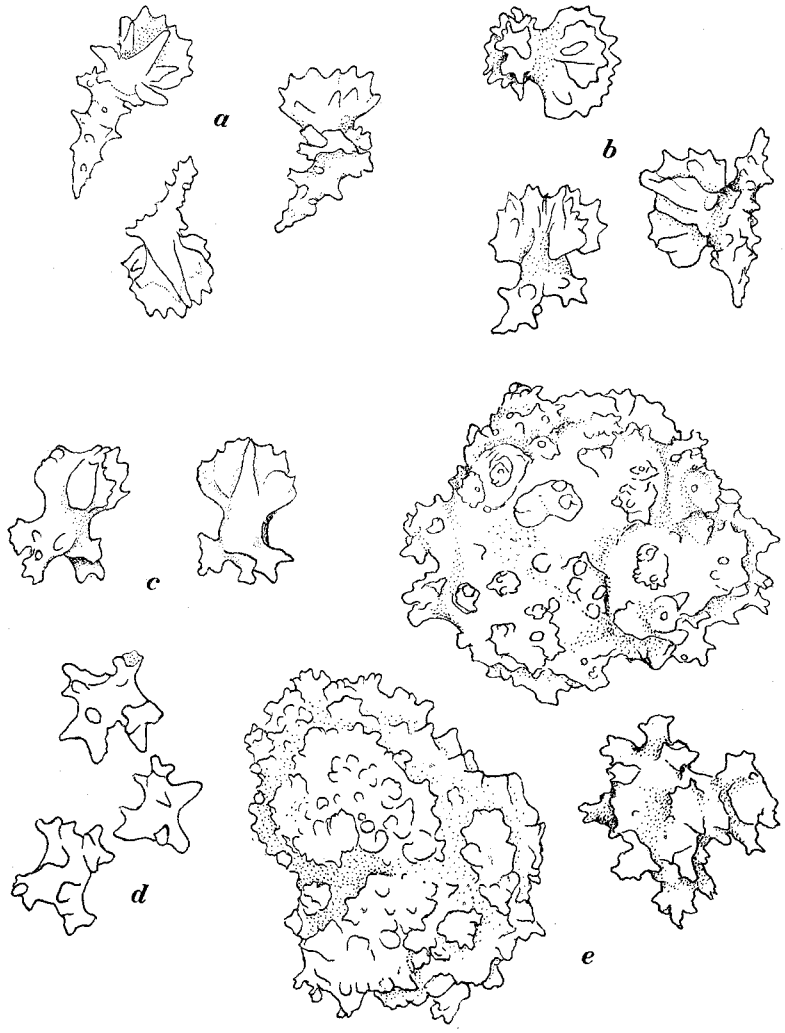

Fig. 1. *Capnella imbricata* (QUOY and GAIMARD) (=*Paranephthya capitulifera* WRIGHT and STUDER).

a, Foliated clubs from the distal part of polyps; *b*, foliated capstans from the lower part of polyps; *c*, foliated capstans from the stem cortex; *d*, basal processes of the same, viewed from bottom; *e*, tuberculate spheres and 4-rayed spicule from the stem coenenchyme. [All ×210]

As regards the generic treatment of the genus *Eunephthya*, VERRILL himself (1922, p. 28) pointed out that the genotype he originally designated is a single species *E. thyrsoidea* VERRILL (there misspelled as *E. thyrsoides*) from South Africa and not a cold-water species *E. glomerata* from Greenland, and further that the former is generically identical with *Capnella rugosa* KÜKENTHAL from South Africa. Nevertheless, he denied its generic identity with the typical *Capnella* (sensu GRAY), adhering too much to GRAY's original misprint written as "Polypes retractile" (cf. VERRILL, 1922, p. 29, footnote).

Most of the later authors such as KÜKENTHAL, JUNGERSEN, BROCH, MOLANDER and DEICHMANN, however, have assigned most of the northern Nephtheidae with non-retractile anthocodiae to the genus *Eunephthya* (sensu KÜKENTHAL). KÜKENTHAL (1906 and 1907) then merged also a warm-water genus *Paraspongodes* with non-retractile anthocodiae, which he formerly established, into it, which example was provisionally followed by UTINOMI (1951).

More recently, BROCH (1939) and MADSEN (1944) have adopted the genus name *Capnella* instead of *Eunephthya* for the northern boreal forms, considering that *E. glomerata* VERRILL belongs to the same genus as *Capnella imbricata* (QUOY and GAIMARD).

In fact, most of the species of *Capnella* (and also of *Paraspongodes*) living in tropical or warm temperate seas resemble closely the northern boreal forms known as belonging to *Eunephthya* (sensu KÜKENTHAL) in the growth form and the non-retractility of polyps, but differ in the spiculation of polyps and coenenchymes.

Emended Generic Diagnosis:—Nephtheids of upright, stout growth, tree-like or bushy. Polyps grouped, incurved and without 8-serially arranged spicules, non-retractile. Canal-walls with numerous scattered spicules. Spicules of polyps foliaceous or spiny spindles, capstans or clubs scaly arranged externally, which are continued with some changes in the form of spicules on to stem cortex in the deeper layers; those of canal-walls are stout tuberculate spheres, double-spheres or spindles.

Previously Known Species and Their Probable Synonymy:—This genus contains nine species which may be considered valid. The synonyms given here are only provisional and their decision will be possible by re-examining the type specimens, if still available.

1. *Capnella imbricata* (QUOY and GAIMARD)

Alcyonium imbricatum QUOY and GAIMARD, 1833, p. 281.
Capnella imbricata GRAY, 1869, p. 129.
Paranephthya capitulifera WRIGHT and STUDER, 1889, p. 227.
Ammothea imbricata STUDER, 1878, p. 634.
Paranephthya capitulifera STUDER, 1895, p. 127.
Capnella philippinensis, with var. *mindorensis, arborea* and *albida* LIGHT, 1913, pp. 436–446.
Capnella capitulifera LIGHT, 1913, p. 435.

Capnella imbricata THOMSON and DEAN, 1931, p. 71; ROXAS, 1933, p. 390; MACFADYEN, 1936, p. 49.
? *Nidalia foliacea* MAY, 1900, p. 101. (cf. UTINOMI, 1958, p. 112)

2. *Capnella thyrsoidea* (VERRILL)

Nephthya thyrsoidea VERRILL, 1865, p. 192.
Eunephthya thyrsoides VERRILL, 1869a, p. 284; 1869b, p. 47.
Eunephthya thyrsoidea VERRILL, 1922, p. 29.
Nephthya rugosa KÜKENTHAL, 1901, p. 299.
Capnella rugosa KÜKENTHAL, 1006, p. 68.
Capnella rugosa THOMSON, 1910, p. 575.
Capnella gilchristi THOMSON, 1910, p. 578.
Capnella rugosa MACFADYEN, 1936, p. 51; BROCH, 1939, p. 59.
? *Gersemia australiensis* THORPE, 1928, p. 514.
nec *Eunephthya thyrsoides* THOMSON, p. 580.

3. *Capnella spicata* (MAY)

Ammothea spicata MAY, 1900, p. 140.
Capnella spicata KÜKENTHAL, 1903, p. 131.

4. *Capnella fungiformis* KÜKENTHAL)

Capnella fungiformis KÜKENTHAL, 1903, p. 133.
Capnella fungiformis THOMSON and MACKINNON, 1910, p. 179; THOMSON and DEAN, 1931, p. 71; MACFADYEN, 1936, p. 48; UTINOMI, 1956, p. 231.

5. *Capnella morula* THOMSON and MACKINNON

Capnella morula THOMSON and MACKINNON, 1910, p. 179.
Capnella morula THOMSON and DEAN, 1931, p. 73.

6. *Capnella parva* LIGHT

Capnella parva LIGHT, 1913, p. 446.
Capnella parva ROXAS, 1933, p. 392; from Palau, UTINOMI (unpublished).

7. *Capnella ramosa* LIGHT

Capnella ramosa LIGHT, 1913, p. 448.
Capnella ramosa ROXAS, 1933, p. 391.

8. *Capnella sabangensis* ROXAS

Capnella sabangensis ROXAS, 1933, p. 393.

9. *Capnella lacertiliensis* MACFADYEN

Capnella lacertiliensis MACFADYEN, 1936, p. 49.

Genus *Scleronephthya* WRIGHT and STUDER

(Figs. 2, 3)

1889 *Scleronephthya* WRIGHT and STUDER (Type: *Scleronephthya pustulosa* WRIGHT and STUDER) Rep. Sci. Res. Challenger, Zool., 31, p. 229.
1896 *Paraspongodes* (part) KÜKENTHAL, Abh. Senckenb. Naturf. Ges., V, 23, p. 132.

1900 *Paraspongodes* (part) MAY, Jena. Z. Naturw., 33, p. p. 146.
1903 *Scleronephthya* KÜKENTHAL, Zool. Jahrb. Abt. Syst., XIX, 1, p. 140.
1909 *Scleronephthya* THOMSON and SIMPSON, Alcyonarians of the Littoral Area, p. 139.
1931 *Scleronephthya* THOMSON and DEAN, Siboga-Expeditie, 13d, p. 178.
1934 *Scleronephthya* ROXAS, Philipp. J. Sci., 50, p. 406.

Redescription of the Type Specimen of *Scleronephthya pustulosa* WRIGHT and STUDER :—This specimen was obtained by the "Challenger" Expedition from the Philippine Islands (Station 208: Lat. 11°37′ N., Long. 124°31′ E., 18 fms.). Later, the same species was collected by the "Siboga" Expedition at eight stations in the Malayan waters. Otherwise it was previously not found.

WRIGHT and STUDER's original description and figures are not satisfactory for recognizing its concrete generic character. Therefore I re-examined a part of the type specimen and figured the details of its peculiar spiculation.

The polyps, much like those of the preceding species, are club-shaped, though not so incurved, and non-retractile. They are crowded at the end of lobes. Each one is about 1 mm long and just as wide as long. Apparently they are slightly 8-lobed at the tip, each consisting of a large pinnular tentacle withdrawn inward.

The surface of both the polyps and branches is evenly granular in appearance owing to the outer covering of small spicules which are mostly opaque, chalk-white, somewhat flattened, tuberculate rods; they are a little larger in the branch cortex than in the polyps.

Just beneath the outer layer of these small spicules, there are large spindles. In the polyp head, these large spindles are arranged in 8 double rows, indistinctly converging upward and then becoming horizontal downward, though not forming a sort of collaret just below the tentacles so definitely marked off from the others as shown in the original figure (cf. WRIGHT and STUDER's plate 36A, fig. 2c).

These large spindles are usually bent, slender and tuberculated with conical warts. Toward the stem cortex they become larger, more robust with blunt-ended warts, and are scattered irregularly.

The tentacles are bent inwards over the mouth, and provided with flattened tuberculate rods *en chevron* on the dorsum and minute rodlets transversely on the pinnules.

The canal-walls are relatively thick and free from spicules at least in the terminal twigs. The canals are relatively wider, less numerous and contain well-developed gonads supported by mesenteries.

Measurements of Spicules (in mm) :—

Outer layer of polyps: Flattened tuberculate rods, opaque and chalk-white—0.05×0.026; 0.07×0.035; 0.12×0.02

Outer layer of branch cortex: Flattened tuberculate rods, opaque and chalk-white—0.07×0.035; 0.14×0.05; 0.17×0.08

Inner layer of polyps: Slender tuberculate spindles, transparent and colorless—0.1×0.018; 0.35×0.02; 0.7×0.035; 0.8×0.035

Inner layer of branch cortex: Robust, tuberculate spindles, transparent and colorless—0.28×0.1; 0.35×0.07; 0.5×0.1; 0.7×0.12

Tentacle: Flattened tuberculate rods, often pointed at one end—0.2×0.017; 0.35×0.035

Pinnule: Flattened rodlets—0.07×0.017

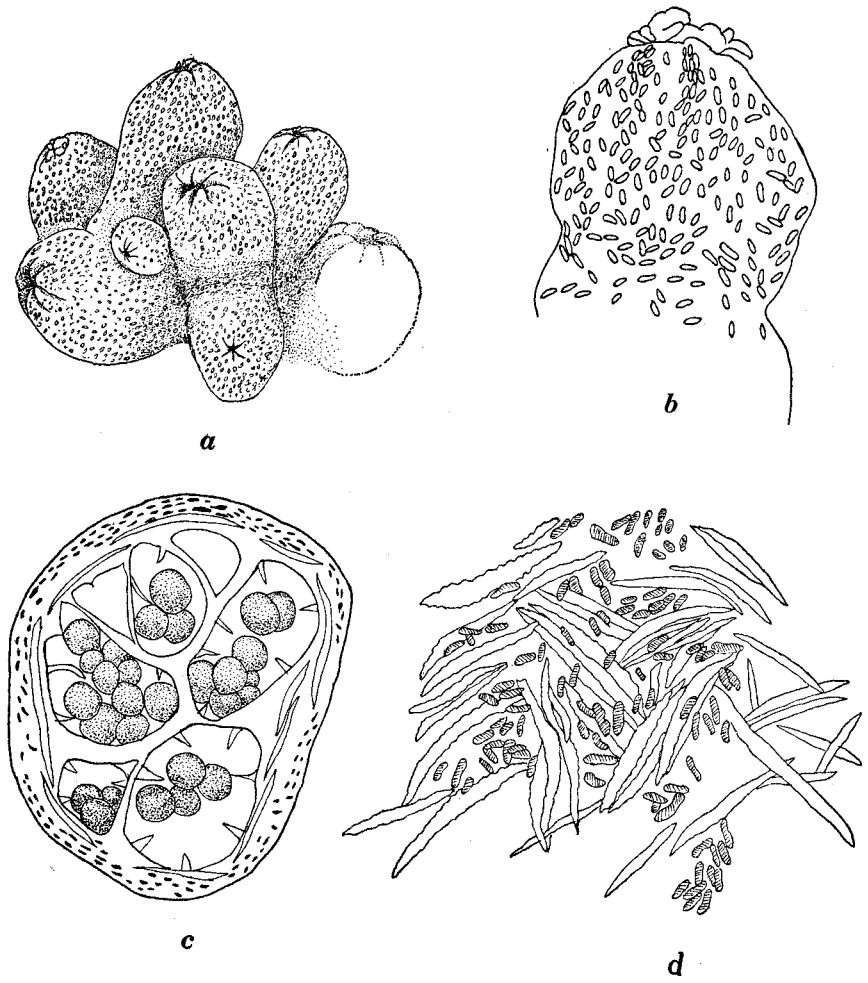

Fig. 2. *Scleronephthya pustulosa* WRIGHT and STUDER.

a, Polyps grouped together; *b*, polyp magnified, showing only the outer covering of small spicules; *c*, section of a terminal twig, showing the arrangement of small spicules in the outer layer and of larger spindles in the inner layer of the cortex; *d*, part of polyp armature (small spicules are scattered in the outer layer and large spindles indistinctly chevroned in the inner layer). [*a*×17; *b*, *c*×30; *d*×50]

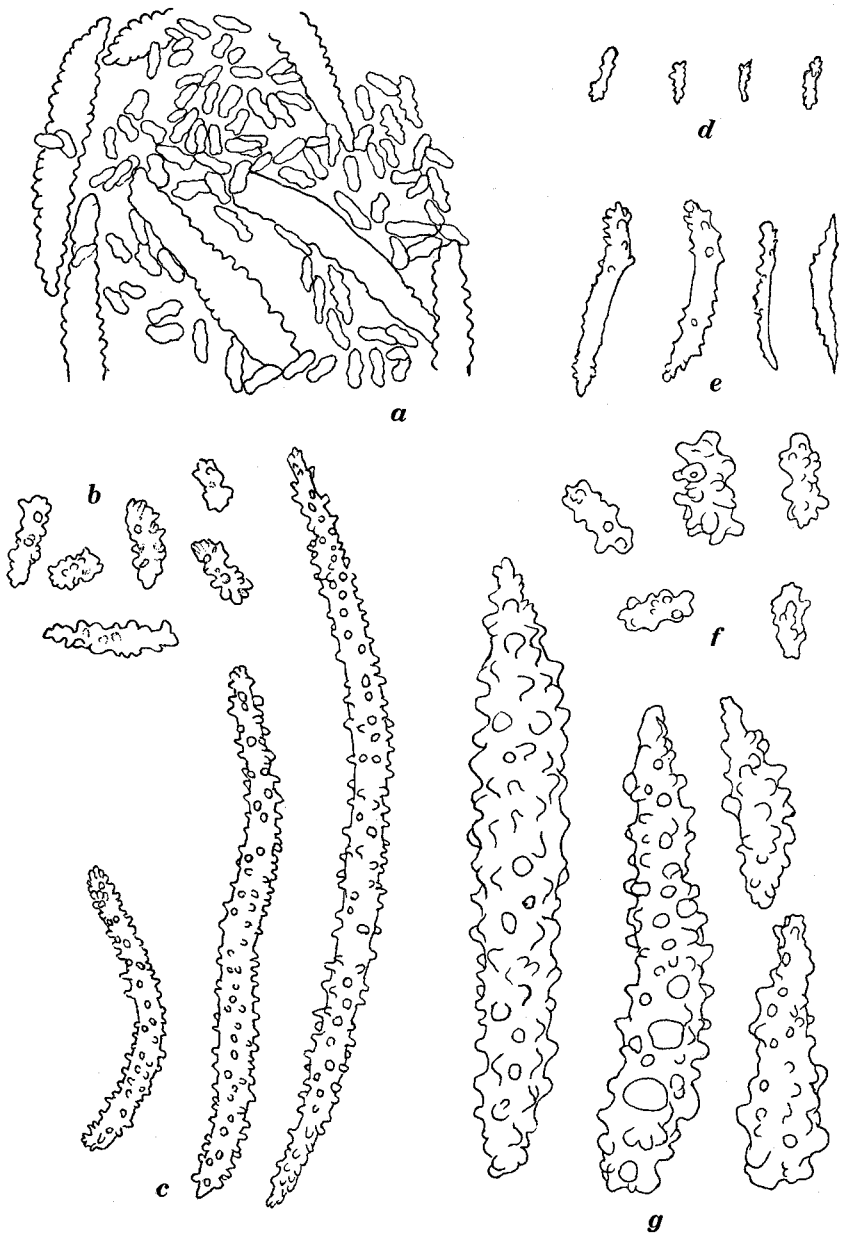

Fig. 3. *Scleronephthya pustulosa* WRIGHT and STUDER.

a, Part of stem cortex, viewed from outsides; *b*, small spicules from the outer layer of polyp covering; *c*, large spicules from the inner layer of polyp covering; *d*, spicules of pinnules; *e*, spicules of tentacles; *f*, small spicules from the outer layer of stem cortex; *g*, large spicules from the inner layer of stem cortex.

[*a*×50, *b*–*g*×127]

Remarks:—This genus was provisionally united by KÜKENTHAL (1896, p. 88) with his established elastic genus *Paraspongodes*, which example was followed by MAY (1900, p. 142). However, STUDER (1901, p. 30) first considered it as a distinct genus, separating from the latter genus. KÜKENTHAL (1903, p. 140) also accepted the genus as a bridge between the genera *Capnella* and *Lemnalia*.

Besides the type species, two forms S. *flexilis* THOMSON and SIMPSON (1909, p. 139) and *S. flexilis* var. *compacta* THOMSON and DEAN (1931, p. 180) were recorded from Indo-Malayan waters and both referred to this genus on the upwardly chevroned polyp spicules arranged in eight indefinite groups (points), but no mention of such overlying smaller spicules as seen in the type species *S. pustulosa*.

If the latter point, namely the presence of smaller spicules in the outer covering is considered solely as a specific character peculiar to *S. pustulosa*, two other forms cited above may also be duly referable to the genus *Scleronephthya* by defining the genus as below.

Emended Generic Diagnosis:—Tree-like nephtheids with non-retractile polyps thickly covered in groups on branches. Polyp spicules mostly spindle-like, arranged in 8 obscurely converging double rows tending to become irregular toward branch cortex. Canal-walls of stem concentrated and filled with spicules, but in branches peripherally, forming a more compact covering of spicules.

Genus *Chondronephthya*, n. gen.

(Figs. 4, 5)

Type Species: *Eunephthya fusca* WRIGHT and STUDER, Rep. Sci. Res. Challenger, Zool., 31, p. 190, pl. 36, figs. 1*a*, 1*b*.

Type Locality: Challenger Station 163A, off Port Jackson (Lat. 36°59′S., Long. 150°20′W., depth 150 fathoms).

Redescription of the Type Specimen of *Eunephthya fusca* WRIGHT and STUDER:—The type specimen, with three polyps grouped, of this unique species was excellently figured by WRIGHT and STUDER (1889). However, their description without any figure of spicules is too insufficient for recognition of its systematic position.

The material here examined is only a terminal twig cut off from the type specimen preserved in the British Museum (Nat. Hist.).

As inferred from the original figure of the total animal, the colony resembles closely *Paraspongodes crassa* KÜKENTHAL (1896) and its allies in the mode of branching and the arrangement of polyps. The sterile stalk is much shorter than the polyparium at a contracted state; it is according to the original description "about 6 mm in length, and tough, leathery, wrinkled with a rough surface."

On a terminal twig which is about 4 mm wide and somewhat depressed, a

few polyps are grouped rather transversely (2–4 in a group); between them occurs also an isolated polyp.

The polyps are all bent toward the stem, somewhat club-shaped, and with granular surfaces. Their size ranges from 2 mm long, 0.7 mm wide to 2.5 mm long, 1.3 mm wide.

The polyps are non-retractile and not differentiated between the head and

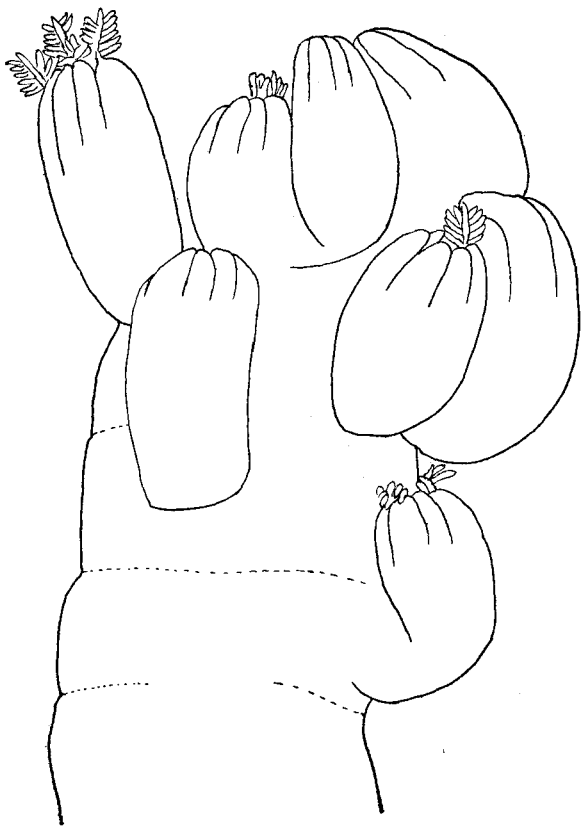

Fig. 4. *Chondronephthya fusca* (WRIGHT and STUDER). End of a terminal twig with a few polyps grouped. [×10]

stalk in spiculation. They are deeply 8-lobed at the tip and tentacles are folded together over the mouth.

The tentacles are distinctly ringed all throughout and bear 6–8 pairs of moniliform pinnules, and lack spicules at all.

The surface of the polyps is thickly packed with many, straight or bent, slender spiny spindles up to the end of the distal lobes around the mouth.

These spindles are often unilaterally spined in shorter forms, so that the extreme one more developed toward the distal end may be said as "spiny club."

The outer surface of the twigs is, however, closely packed with numerous minute multituberculate granules. No spicules are found in the canal-walls, at least of terminal twigs.

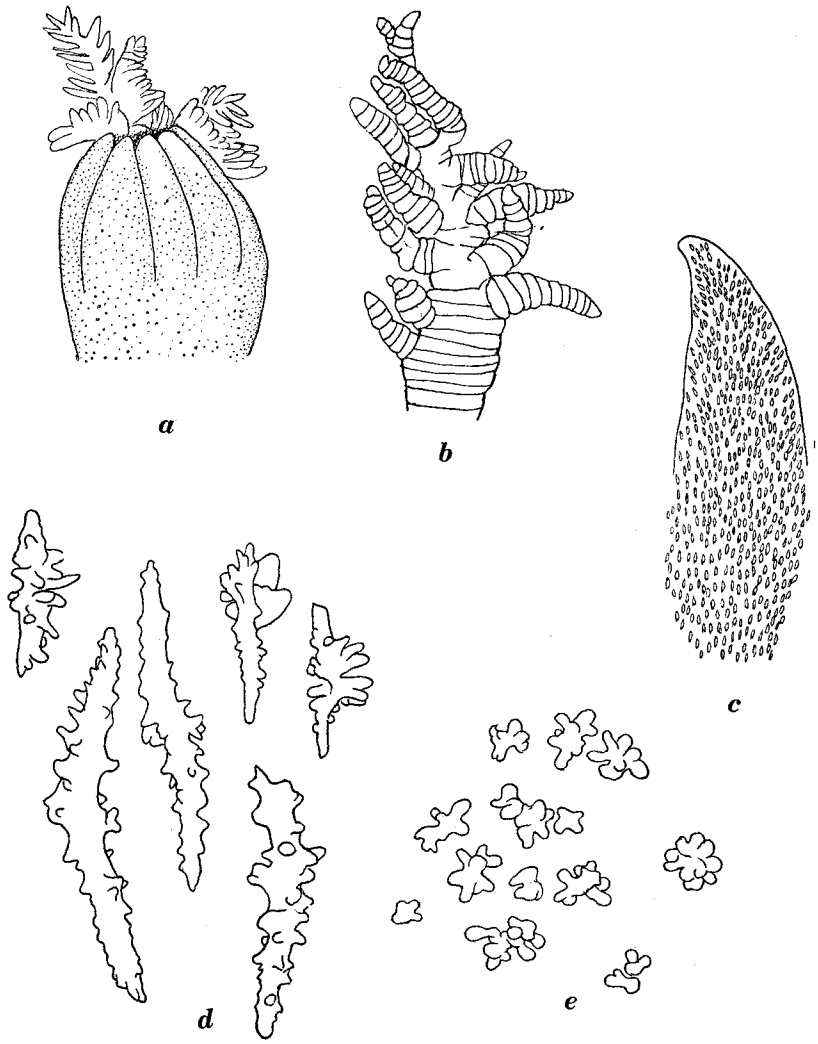

Fig. 5. *Chondronephthya fusca* (WRIGHT and STUDER).

a, Distal part of a polyp with tentacles partly extended; *b*, oral side of tentacle; *c*, distal lobe continued from interseptal area of the polyp head, showing the arrangement of spicules; *d*, spicules from polyps; *e*, spicules from branch cortex. [*a*×27, *b*×80, *c*×50, *d*–*e*×150]

Measurements of Spicules (in mm):—
Spindle form in polyps—0.2×0.03; 0.23×0.03; 0.26×0.05
Club-like form in polyps—0.1×0.03; 0.14×0.07; 0.17×0.035; 0.2×0.05; 0.23×0.035
Tuberculate granule in branch cortex—0.035–0.1 wide

Remarks:—This species was originally assigned to the genus *Eunephthya* (sensu VERRILL) which has been generally known as a cold-water genus. Besides this species, as far as I am aware, 5 new species referring to the genus *Eunephthya*, have been recorded from the tropical or subtropical area of the Indian Ocean. They are: *E. maldivensis* (HICKSON, 1905, p. 824), *E. purpurea* (THOMSON and HENDERSON, 1905, p. 276), *E. abrolhosa*, *E. whitei* and *E. brochi* (THORPE, 1928, pp. 511–513); and also an enigmatic form "*E. thyrsoides*" (THOMSON, 1910, p. 580).

KÜKENTHAL (1907, pp. 379–380) quoted the first two species with a query, suggesting their affinities with *Dendronephthya* or *Scleronephthya*. His opinion was, however, not accepted by HICKSON (1908, p. 173). Practically it is very difficult to determine their systematic position with certainty from the literature, unless a careful re-examination on the type specimens is directly made.

Apart from these doubtful species, I am convinced that WRIGHT and STUDER's *E. fusca* only represents a new unique genus placing in the nephtheid group on account of its granular spiculation and other peculiarities described above, although KÜKENTHAL (1907, p. 376) merely suggests that it may belong to either *Nephthea* or *Capnella*.

Generic Diagnosis:—Nephtheids of tree-like growth form with short sterile stalk and polypiferous small twigs arising from branches in rings around stem; a small number of polyps grouped transversely on twigs. Polyps non-retractile, incurved, strongly 8-lobed at tip and with moniliform tentacles. Spicules of polyps small spiny spindles, often unilaterally spined or club-like, scattered all throughout, not forming any points. Spicules of stem cortex minute tuberculate granules. Canal-walls devoid of spicules.

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